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THE SURGEON AND THE PATHOLOGIST.

A Plea for Reciprocity as Illustrated by the Consideration of the Classification and Treatment of Benign Tumors of the Breast.

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Boston.

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ORATION ON SURGERY AT THE FIFTY-SIXTH ANNUAL SESSION OF THE AMERICAN MEDICAL ASSOCIATION, PORTLAND, OREGON, JULY 11-14, 1905.

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Fig. 1.—Adenocarcinoma and papillary cyst-adenoma. Gross appearances.

Fig. 2.—Adenocarcinoma and abnormal involution. Gross appearances.

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SYNOPSIS.

1. INTRODUCTION: Subject of paper. Confusion of nomenclature. National and local differences. Differences between clinician and pathologist. Need of co-operation. Clearing house.
2. MATERIAL: 658 consecutive cases of chronic disease of breast in M. G. H. 100 cases from private practice (70 diagnoses in 199 cases of benign breast tumor in M. G. H.).
3. CLASSIFICATION: Normal anatomy of breast. Relation to tumors and diseases. Classification offered. Variation from other classifications.
4. CARCINOMA: 517 cases. Proportion to other tumors, 68 per cent. (70 per cent., M. G. H.) (58 per cent., J. C. W.). Varieties. Age incidence. Occurrence with or resulting from benign tumors and diseases, as Involution, papillary cyst adenoma, periductal fibroma, Paget's disease.
5. FIBRO-EPITHELIAL TUMORS: Fibrous Group. Periductal tumors. Fibroma, myxoma. sarcoma. Frequency. Pathology. Clinical symptoms. Diagnosis. Course. Prognosis. Treatment.
6. FIBRO-EPITHELIAL TUMORS: Epithelial group. Cyst-adenoma. Fibro-Cyst-Adenoma: Rare. Epithelial exaggeration of periductal fibroma. Pathologic symptoms. Treatment. Papillary Cyst-Adenoma: Pathology. Symptoms. Prognosis. Treatment.
7. HYPERPLASIA. DIFFUSE HYPERTROPHY: Two varieties. Rare. Relation to pregnancy and to genital abnormalities. Pathology. Symptoms. Treatment.
8. HYPERPLASIA. ABNORMAL INVOLUTION. "Chronic Cystic Disease." Historical. Synonyms. Pathology. Cystic and proliferative. Types of proliferation. Symptoms. Course untreated. Prognosis. Treatment.
9. CHRONIC INFLAMMATION: Chronic abscess. Ductal mastitis. Relation to lactation. Symptoms. Course. Pathology and Treatment. Galactocele.
10. SINGLE RETENTION CYST: Mechanical origin. Rarity. Symptoms. Confusion with abnormal involution.
11. NON-INDIGENOUS TUMORS OF BREAST: Sarcoma. "Solid sarcoma." Rare. No relation to breast. Symptoms. Diagnosis. Treatment. Lipoma. Retro-mammary. Symptoms and treatment. Lymphangioma.
12. SUPERNUMERARY BREASTS: Occurrence. Situation. Tendency. to tumor formation.
13. TREATMENT of benign tumors of the breast. "Plastic resection." Indications. Method. Results.

In selecting a subject in a special department of medicine which should be of interest to the great body of members of this Association, it has occurred to me that the discussion of the diseases of the mammary gland would be appropriate, as the classification of the diseases of this organ is at present in a more or less unsettled state, and the operative treatment of many of the benign lesions of the breast is a subject which is still open to discussion.

The great impetus which laboratory work has received in recent years in the various medical centers of this country is evidence that the interest taken in the scientific side of medicine has progressed steadily since the awakening of modern pathology in the middle of the last century. American physicians have proved themselves apt pupils, and the beginnings of the generation which is now passing off the stage have already borne fruit which one can not regard otherwise than with satisfaction. The time has already arrived when we in this country are no longer content to receive the dicta of science at second hand, but feel quite competent to take the initiative on ourselves, as our many substantial contributions to medical science amply show. Indeed, I feel convinced that the very practical side of our national character is a most valuable quality in

enabling us to unravel some of the more complicated questions which have been left unsolved by the foreign scientists. The laboratory workers' range of vision, however, is often at best but microscopic, and it is no wonder that, unaided, he sometimes misinterprets the changes rung by nature on some simple theme. Without the laboratory worker's aid, however, the clinician becomes swamped in a mass of clinical detail from these diseases into focus with the clinical pictures which they present. In the hope that I may pave the way for the clinician and the pathologist to "get together" and to put the classification of diseases of the breast on a more intelligible and practicable foundation, I have selected this field of surgery for your consideration.

Fig. 3.*—Periductal fibroma. Gross appearances.

which alone he has again and again been unable to extricate himself. There can be little question that the combination of energies which accomplishes most in surgical progress is that obtained by the coöperation of the laboratory investigator with the surgeon of clinical experience. Too long have these two departments of medicine conducted themselves independently and, as I feel, greatly to the disadvantage of them both. The clinician and the laboratory man, however, in these days of specialism seem sometimes in danger of drifting even further apart, and we find some of the modern problems sadly in need of a pathologic "clearing-house" to put things on a more practical basis. This, it seems to me, is the moral which must be read between the lines of the paper which I have the honor to present.

In no department of surgery has the classification of the diseases of an organ or the pathologic nomenclature been more confusing than in the case of the diseases of the mammary gland. Not only has the nomenclature of the diseases of the breast been subject to that continual revision to which all medical terms are liable with advancing knowledge, but in this case national and even local systems have added again to the confusion. The French school, the German, the English and the American schools of medicine rarely agree in their description of any tumor of the breast other than carcinoma, and in the case of the inflammatory or involution changes of the breast the variations in nomenclature are notorious. In view of the always horrible possibility of cancer, however, no woman can regard a lump of any size, shape or consistency in the breast with equanimity, and in no organ does the presence of disease in its earlier stages furnish fewer data for accurate diagnosis. The cry for aid and comfort is always an urgent one, and it behooves the surgeon, therefore, and the general practitioner as well, to be in a position to meet the demand for accurate information with an intelligent and harmonious reply. Such a statement can be furnished only by bringing the modern views of the pathology of

* Figs. 1 and 2 compose the frontispiece facing page 145.

The material which has served as a basis of this investigation includes, in all, 758 cases of diseases of the breast; 658 cases were taken from the records of the Massachusetts General Hospital.[1] The diseases of the male breast were purposely omitted from this table of cases, and of the total number of cases of diseases of the female breast 10 were omitted because of insufficient data to establish a diagnosis. Acute mammary abscess was also excluded from consideration. With these exceptions all cases of disease of the mammary gland are included which entered the Massachusetts General Hospital during the decade from 1895 to 1905. One hundred additional consecutive cases of disease of the breast have been obtained from my own private practice, making up the total of 758 cases of all varieties with which we have to deal. Pathologic reports were available in nearly every case, and in many instances the actual specimens could be obtained and were used for further study and for purposes of illustration. Four hundred

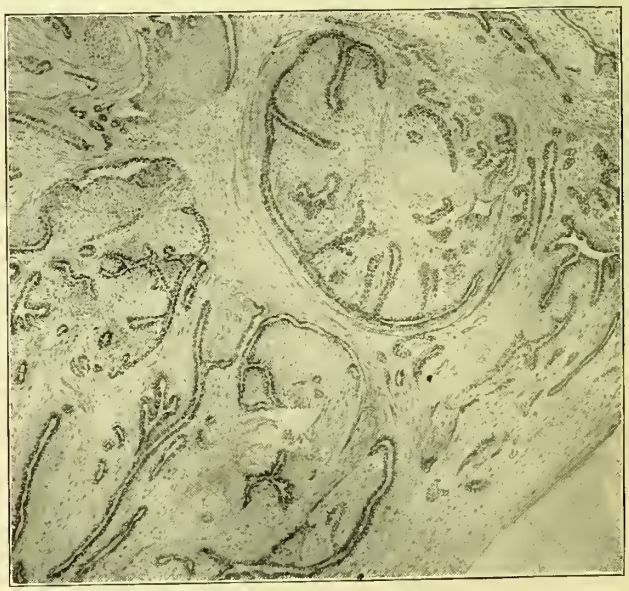

Fig. 4.—Periductal fibroma. Microscopic appearances.

and fifty-nine of the hospital cases and fifty-eight of the cases in private practice were cancer of the breast. These were included for purposes of comparison and in order better to establish the significant data for diagnosis. The greater part of the study, however, has been

1. Collected and analyzed by Drs. R. B. Greenough and C. C. Simmons, whose valuable assistance in the preparation of this classification I wish here to acknowledge.

devoted to the benign diseases of the breast, 42 in private practice, 199 in the hospital series—a total of 241 cases of benign diseases of the breast. These are exclusive of re-entries or of cases in which two diseases of different types occurred. As an instance of the confusion in nomenclature I might here state that in 199 cases of benign disease of the breast occurring in the

Fig. 5.—Fibro-cyst-adenoma. Microscopic appearances. (Note cyst cavities and exuberant growth of epithelial ducts in lobular arrangement in a stroma of periductal tissue. Gross appearance of this tumor similar to Figure 3.)

Massachusetts General Hospital in ten years, 70 different pathologic diagnoses appeared on the record books.

Before taking up the question of classification of the benign tumors of the breast, I would like to call your attention to some anatomic peculiarities of the mammary gland which distinguish it from any other organ in the body. At no time during the various periods of its life history does it have an enduring type of anatomic structure. At birth the gland is represented by a series of radiating ducts with club-shaped extremities, but with no well-developed acini. The epithelium of these ducts is often in a state of active proliferation, causing swelling and tenderness of the gland, with ectasia of the ducts and supposed inflammation (acute mastitis of infants). Infection through the nipple may undoubtedly occur at this time, but in the vast majority of cases the swelling and tenderness are due entirely to the developmental activity of the gland. No material change in the gland takes place from this time until the age of puberty, when the development of the acini first really begins. An enlargement of the breast, with development of considerable tenderness, is often noticed at puberty in males as well as females. The epithelial structures are now beginning to make themselves prominent, but there is also a characteristic change in the tissue immediately around the ducts. The periductal connective tissue becomes transparent and rich in nuclei and presents a strong contrast to the interstitial tissue of the gland. This transparent periductal tissue is peculiar to the mammary gland. It gives the familiar consistency and shape to the virgin breast and enters largely into the new growths of the breast which take origin at this stage of its life history.

At the time of pregnancy another great change takes place in the anatomy of the breast. Now the epithelial activity of the gland is at its height, the acini multiply enormously, the tree may be said to be in full leaf. Meanwhile the interstitial tissue becomes stretched and the periductal tissue becomes less prominent. After lactation many of the acini wither and disappear, the interstitial tissue is relaxed and the breast becomes pendulous.

The declining period in the life history of the mammary gland may begin in middle life, and presents a condition which is of great interest to the surgeon. The breast, as it were, gradually dries up. Change is noticed especially in the acini and in the interstitial tissue. The epithelium is no longer in a state of active proliferation, but degenerative changes gradually gain the upper hand. Some ducts are choked with epithelial débris, while others are compressed by the contracting interstitial tissue of the gland, and the blood vessels become thrombosed and disappear. Obstruction takes place here and there, and slight dilatation of the small ducts and acini occurs, with induration of the surrounding tissues. If the breast in this condition is gently pressed against the thorax with the flat of the fingers it will be found to contain a large number of small hard nodules. This condition I have described as the "cobble-stone" feel of the breast. It is present in almost every breast at a certain stage of its decline, and should be regarded as a normal condition at this period of the life history of the gland. If the gland is incised these nodules will be found to be composed of fibrous tissue or of small cysts filled with a slightly discolored fluid which derives its hue from solution of the old blood crystals and pigment from the thrombosed blood vessels.

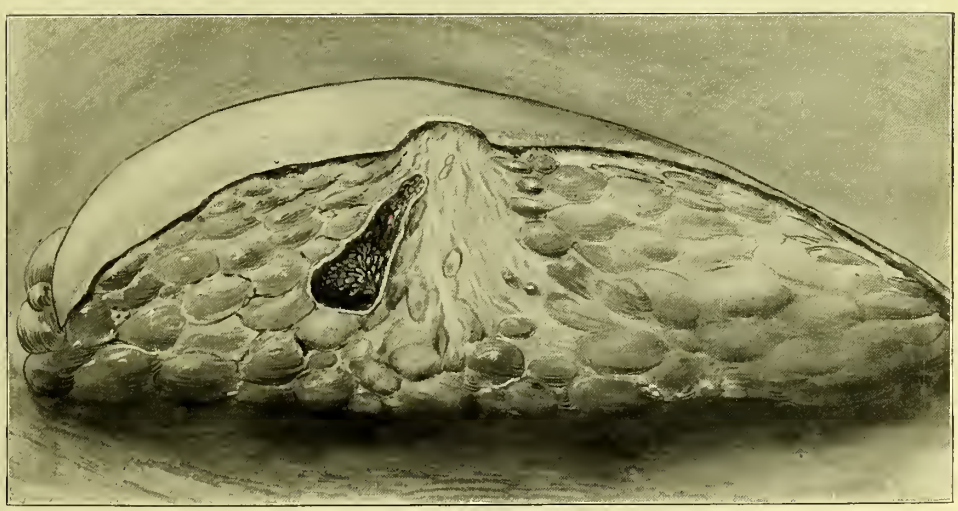

Fig. 6.—Papillary cyst-adenoma ("villous papilloma"). Gross appearances.

The gland tissue is absorbed after lactation[2, 3] and with advancing years, a certain amount of adipose tissue takes its place, and in old age we find the mammary gland represented merely by a few ducts near the nipple and some small strands of fibrous stroma, the meshes of which are well filled with fat. Keeping in mind the anatomic peculiarities of the mammary gland, we find two distinct structures intimately associated with different periods of its life history. I refer to the periductal fibrous tissue so prominent in early life and to the epithelial elements which at certain later periods, as in lactation, attain the perfection of their development. These two structures are so intimately associated one with another that it is impossible for a neoplastic formation to develop without partaking somewhat of the characteristics of both tissues. The periductal fibrous tissue of the gland can not form a tumor without involving, to a certain extent, the epithelium of the ducts. Nor can the epithelial elements grow entirely independent of their fibrous support without placing the growth at once in the category of carcinoma. A consistent classification of the tumors of the breast must, therefore, take into consideration both of these elements, and the term "fibro-epithelial" tumors, suggested by Ribbert.[4] best meets these indications.

Fig. 7.—Papillary cyst adenoma. Microscopic appearances. (Note exuberant growth of epithelium over papillary outgrowths of connective tissue from the wall of the cyst cavity.

Tumors are classified, however, either according to the nature of the tissue of their origin or the tissue which forms their most significant part. In these fibro-epithelial tumors, therefore, certain subdivisions are possible and, indeed, important, according to the tissues which are most seriously involved. A ready distinction is suggested at once between the tumors which are chiefly of a fibrous character and those in which the epithelium is more involved. This distinction, moreover, has an important clinical value, as there is a tendency of the fibrous group toward sarcomatous change and of the epithelial group toward carcinomatous metamorphosis. Under fibro-epithelial tumors of a fibrous character we may thus distinguish three divisions—the periductal fibroma, periductal myxoma, and periductal sarcoma. Those of the epithelial group we can divide into the fibro-cyst-adenoma and the papillary cyst-adenoma. In

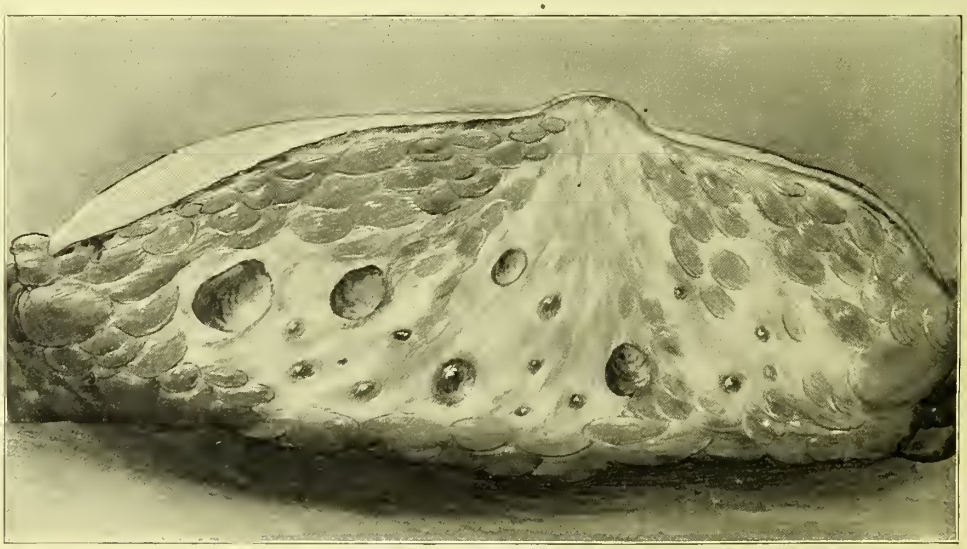

Fig. 8.—Abnormal involution ("chronic cystic disease," "chronic cystic mastitis"). Gross appearances.

2. Warren: International Text-Book of Surgery, second edition, vol. ii.

3. Warren: "American Text-Book of Pathology." "Pathology of the Breast."

4. Ribbert, H.: "Allgemeine Pathologie," Leipzig, 1901. F. C. W. Vogel.

the tumors of the fibrous group the fibrous tissue is the predominant feature of the tumor, epithelium being present, but playing only a subordinate part. In the epithelial group the fibrous tissue is present also, but merely in sufficient quantity to be regarded as a stroma, the growth of epithelium being the predominant feature of the tumor.

The term hyperplasia I have reserved for those diffuse changes which are characteristic of the breast at certain periods of its life history. From their very diffuse character, these can not properly be placed within the category of tumor formation. They cover not only that common condition which we find so characteristic a feature of the involution stage of the normal breast and which has passed under the many terms of "chronic cystic mastitis," "cystic disease of the breast," etc., but also that rare diffuse hyperplastic growth of all the elements of the gland at the period of highest physical development—"diffuse hypertrophy." The chronic inflammatory processes of the mammary gland present no special difficulties in classification; but they, as well as the non-indigenous tumors of the breast, are included in the table to round out the classification of all lesions, with the exception of acute mammary abscess.

TABLE I—Classification of 758 Cases of Breast Tumor.

	M.G.H.	Private Cases.	Total	Per Cent.
Carcinoma	459	58	517	68
Fibro-Epithelial Tumors	.....	.....	(86)	(11)
(1) Fibrous type	.....	.....	(70)	(9)
1. Periductal fibroma	48	6	54	7
2. Periductal myxoma	10	2	12	1.6
3. Periductal sarcoma	4	0	4	.5
(2) Epithelial type (Cyst adenoma)	.....	.....	(16)	(2)
1. Fibro cyst-adenoma	3	1	4	.5
2. Papillary cyst adenoma	9	3	12	1.6
Hyperplasia				
1. Diffuse hypertrophy	2	0	2	.2
2. Abnormal involution (Cyst c, (59) (Proliferative, 56)	87	28	115	15
Chronic Inflammation	.....	.....	(28)	(3.7)
1. Eczema of nipple	2	0	2	.2
2. Chronic abscess	5	0	5	.6
3. Ductal mastitis	3	0	3	.3
4. Tuberculosis	13	0	13	1.7
5. Single retention cyst	5	0	5	.6
Non-indigenous tumors	.....	.....	(9)	(1.2)
1. Sarcoma	4	0	4	.5
2. Lipoma	3	1	4	.5
3. Lymphangioma	1	0	1	.1
Supernumerary breast	.....	1	1	.1
	658	100	758	

The diagnosis of diseases of the breast is undoubtedly the first consideration, and it is for this reason that the cases of carcinoma have been included in the above list and must now receive a brief analysis.

Cancer occurred in 459, or 70 per cent., of all tumors in the hospital cases and in 58, or 58 per cent., of the cases in private practice. The proportion of cancer to other breast tumors was thus greater in hospital cases than in private practice. This is undoubtedly due to the fact that the milder cases of benign tumor are occasionally treated in the out-patient department of a hospital and, therefore, do not enter into this number of cases, whereas in private practice all cases are included. The fact, however, is obvious that cancer forms the great majority of actual growths of the breast, and if the conditions known as abnormal involution are left out of consideration this predominance of cancer over other tumors becomes even more conspicuous.

Paget's disease of the nipple occurred in this number of cases six times in connection with cancer of one or another variety; and eczema of the nipple and areola, similar in every way to Paget's disease, but without evidence of malignancy, was found in two additional cases during this ten-year period.[5]

The forms of cancer which have developed from other benign tumors or conditions of the breast are of special interest to us in this connection. During this period thirteen cases occurred in the hospital and

Fig. 9.—Abnormal involution. Microscopic appearances. Acinal type of epithelial proliferation.

four in the cases of private practice, in which cancer resulted from, or was present in connection with, benign diseases of the breast.

The involution changes of the breast are those which accompany or precede cancer more frequently than any other form of benign lesion, and by far the greatest

Fig. 10.—Abnormal involution. Microscopic appearances. Papillary and adenomatous types of epithelial proliferation.

number of cases of this character, show the picture of adeno-carcinoma. Nine cases of adeno-carcinoma and three of medullary carcinoma occurred with abnormal involution. Three cases of scirrhus cancer also occurred

5. Ehrhardt: Deut. Zeit. f. Chir, December, 1899, vol. liv, p. 130.

which presented the lesions of abnormal involution. In the hospital series also two cases of adeno-carcinoma occurred in connection with tumors of the papillary cyst-adenoma type. The significance of these cases of cancer will be especially considered under the discussion of the benign tumors of the breast.

The age incidence of the different tumors and diseases of the breast is a matter of considerable importance in diagnosis. I have arranged Table 2 to show the number and percentage of cases of the different lesions occurring in each decade of life.

TABLE II—Incidence of Breast Tumors by Age Decades.

	No. of Cases.	10-20 Yrs.	20-30 Yrs.	30-40 Yrs.	40-50 Yrs.	50-60 Yrs.	60-70 Yrs.	70-80 Yrs.	80 Yrs.
Carcinoma	459	.....	6 12%	67 60%	151 70%	130 85%	80 92%	24 100%	1 100%
Periductal sarcoma	4	.....	.....	.....	1 .4%	3 2%	.....	.....	.....
Periductal myxoma	10	.....	5 10%	1 1%	3 1.5%	1 .6%	.....	.....	.....
Periductal fibroma	48	4 45%	26 50%	13 11%	4 2%	1 .6%	.....	.....	.....
Fibro-cyst-adenoma	3	.....	1 2%	2 2%	.....	.....	.....	.....	.....
Papillary cyst-adenoma	9	.....	.....	1 1%	3 1.5%	2 1%	3 3%	.....	.....
Diffuse hypertrophy	2	1 11%	.....	.....	1 .4%	.....	.....	.....	.....
Abnormal involution	87	.....	7 13%	20 18%	45 21%	13 8%	2 2%	.....	.....
Eczema of nipple	2	.....	.....	.....	.....	2 1%	.....	.....	.....
Chronic abscess and ductal mastitis	8	.....	2 4%	2 2%	3 1.5%	1 .6%	.....	.....	.....
Single retention cyst	5	.....	2 4%	1 1%	2 1%	.....	.....	.....	.....
Tuberculosis	13	3 33%	3 6%	3 3%	4 2%	.....	.....	.....	.....
Non-indigenous sarcoma	4	.....	.....	2 2%	1 .4%	.....	1 1%	.....	.....
Other non-indigenous tumors	4	1 11%	1 2%	.....	.....	1 .6%	1 1%	.....	.....
Total Cases	658	9	53	112	218	154	87	24	1

By this table it is to be seen that the proportion of cancer to other tumors of the breast is a constantly increasing one to the end of life. While between 20 and 30 years of age cancer occurs in only 6 per cent. of all cases, after 70 years the percentage is 100. All of the twenty-five tumors of the breast occurring in the Massachusetts General Hospital in ten years, in women who were over 70 years of age, were cancer.

The periductal fibromata, on the other hand, are most numerous in the third decade from 20 to 30, and constitute 50 per cent. of all tumors occurring at this period. From this time they gradually diminish in frequency until the sixth decade, after which they disappear.

Of the cyst-adenomata, we find that tumor (fibro-cyst-adenoma) which is most nearly related to the periductal fibromata, appearing in the same decades, the third and fourth, with the majority of the latter; while the papillary cyst-adenoma, beginning in the fourth decade, continues to the seventh, and therefore belongs to a distinctly later period of life.

Abnormal involution reaches high-water mark in the fifth decade, 40 to 50 years, with 21 per cent. of the tumors occurring in this period. This corresponds closely with the average age given for abnormal involution, which is from 42 to 45. The age incidence of other diseases is of less significance. The inflammatory processes, as might be expected, occur especially in the early decades, and tuberculosis, in this series of cases, appears to have affected the breasts of younger women than has generally been believed. The non-indigenous sarcomata of the breast, though few in number, occur rather in the middle period of life.

FIBRO-EPITHELIAL TUMORS.

The fibro-epithelial tumors now present themselves for consideration. These new growths of the breast have been described under so many different names that even an enumeration of all their titles is impossible. Before the middle of the last century all tumors of the breast were regarded as cancer. When Cruveilhier first recognized the existence of benign tumors of the breast a storm of opposition was raised in the French Academy of Medicine. Cruveilhier described a fibroma of the breast, but this name was not accepted, and a multitude of other names were used to describe the tumors of this character. Thus Johannes Müller

Fig. 11.—Abnormal involution and adeno-carcinoma. Microscopic appearances.

adopted the term of cysto-sarcoma-phyllodes; Brodie, sero-cystic sarcoma; Sir Astley Cooper, hydatid tumor. Billroth,[6] fibroma and cysto-sarcoma; Paget, chronic mammary and proliferous cysts. Adenocele, adeno-fibroma, fibro-adenoma, cyst-adenoma proliferum and intracanalicular-papillary-fibroma are all terms which have been used at one time or another to apply to fibrous tumors of the fibro-epithelial group. The reason for this diversity of nomenclature is readily found when the attempt is made to reduce the tumor to its component parts. In one case fibrous tissue predominates, but in another the glandular structures play a more important part. Ribbert[4] undoubtedly reaches the most satisfactory solution of this difficulty by grouping the tumors of this nature apart, not as fibroma or as adenoma, but as fibro-epithelial tumors partaking of the character of both tissues. One fact, however, is apparent in the consideration of these cases; and, although

6. Billroth: Deutsche Chirurgie, vol. xli, Krankheiten der Brustdrüse.

long ago pointed out by Billroth,[6] this fact has not received the attention of surgeons and pathologists which is its due. I refer to the fact that the chief constituent of the tumors of the fibrous type is the peculiar transparent periductal tissue of the female breast. This periductal tissue makes its appearance and develops during the period after puberty and before lactation, and it is at this period that the vast majority of tumors of the fibrous type occur. No one can deny that this periductal tissue is essentially a part of the glandular structure of the breast, and its close relation to the epithelium of the ducts and the interdependence of the two tissues makes it practically impossible for the one to undergo the changes of tumor formation without the other participating in the process to a greater or less extent. For these reasons I have recently adopted the term *"periductal fibroma"* as the most accurate name to apply to the tumors of this character, and this term

Fig. 12.—Plastic resection. Line of incision.

I venture to offer in the hope that the name "adeno" may be reserved for the tumors in which the epithelial elements play a more important part. Cystic dilatation of the ducts or of the characteristic clefts of the periductal fibroma may occur in certain instances, and is due in all probability to the obstruction of the pre-existing ducts. These cysts are thus secondary in character and of relatively secondary importance. The clinical characteristics of the more cystic forms of periductal fibroma are as little to be distinguished as their pathological ones, and although the attempt was made in this investigation to separate the cystic from the more solid tumors of this class, it was soon apparent that no data of value could be obtained. These tumors of the fibrous type may, however, be divided according to their richness in cells or the character of their fibrous tissue, into three groups, fibroma, myxoma, and sarcoma.

PERIDUCTAL FIBROMA.

Under this heading are included the true encapsulated fibro-epithelial tumors arising from the periductal fibrous tissue and composed chiefly of this tissue with a certain admixture of epithelial elements. Of this type of tumor there were forty-eight cases in the hospital series and six in private practice, 7 per cent. of the whole number of diseases of the breast. They varied greatly in size, from a bean to a cocoanut, and fifteen cases had multiple tumors in one or both breasts. The average size was about that of an English walnut. These tumors presented themselves clinically as hard nodules, freely movable in the breast tissue and under the skin. In gross appearance they presented firm, encapsulated tumors of a whitish, glistening appearance on section, and traversed by many cleft-like cavities, which were rarely distended to such an extent as to justify the term of cysts. Microscopically they showed a firm, fibrous capsule limiting them from the rest of the breast substance, but while some were composed of dense tissue, others were looser in arrangement, and some had even a myxomatous appearance which was attributable to edema.

The clinical features of tumors of this group could be summarized as follows:

The greater number occurred in women from 20 to 30 years of age. Unmarried women were most commonly affected. The tumors were of slow growth and painless, although in certain instances increased sensitiveness at the time of catamenia was recorded. The situation of the tumors in the breast was variable, but the upper outer quadrant was most commonly involved. Amputation was required three times on account of the size of the tumor; in the other cases excision or resection was the operation which was performed. Eight of the 48 cases showed cyst formation to a greater or less extent, but no clinical features served to distinguish them from the other cases. In one case the changes of abnormal involution were present in addition to the fibroma, and in one instance also carcinoma appeared to have originated in a tumor of this character.

PERIDUCTAL MYXOMA.

Ten cases occurred in the hospital series and two in private practice. The myxomata were obviously derived from the tumors of the periductal-fibrous group and differed from them only by their size, which was somewhat greater, and by the gross and microscopic appearance of myxomatous tissue on section of the tumor. It seems probable, as recorded by a number of other writers,[7, 8, 4] that the myxomatous character was

7. Schimmelbusch: Archiv für klin. Chirurgie, 1892, vol. xliv, pp. 117 and 102.

8. Schimmelbusch: Deutsche Gesellschaft für Chirurgie, 1890, p. 117.

due for the most part to the edema of the fibrous tissue which is characteristic of the periductal fibromata of the breast. These tumors occurred later in life than the fibromata and were of long duration. Rapid growth, however, was not unusual and the tumors were generally of large size. They were all hard in consistency. Necrosis and ulceration of the skin occurred in two cases, and enlarged axillary glands were sometimes found. Adhesion to the skin was present in one case in addition to the two which showed ulceration. The pathologic characteristics were those of a large lobulated, well encapsulated tumor showing cyst cavities or clefts, and a homogeneous transparent stroma. Except for their size it is obvious that these tumors differed in no marked essentials from the tumors of the fibroma class.

PERIDUCTAL SARCOMA.

Four cases of periductal sarcoma occurred in this entire series. These were tumors of the fibrous group with a stroma so cellular as to demand classification as sarcoma. All, however, presented the combination of cellular fibrous-tissue stroma and epithelial gland ducts. They were, as a rule, large, hard tumors, involving the whole breast, the size of a cocoanut or a child's head. They were lobulated and encapsulated, with a marked tendency to ulceration and to cyst formation. The skin above the tumors was, as a rule, reddened and contained dilated veins, but was not invariably adherent. Axillary glands, as a rule, were not involved. The tumors were of long duration and the patients of advanced age, 44, 51, 53 and 57 years. They were all married women. The growth of the tumor was slow at first, but in two cases had been more rapid within the last few months. Pain was insignificant. Amputation was done in every case.

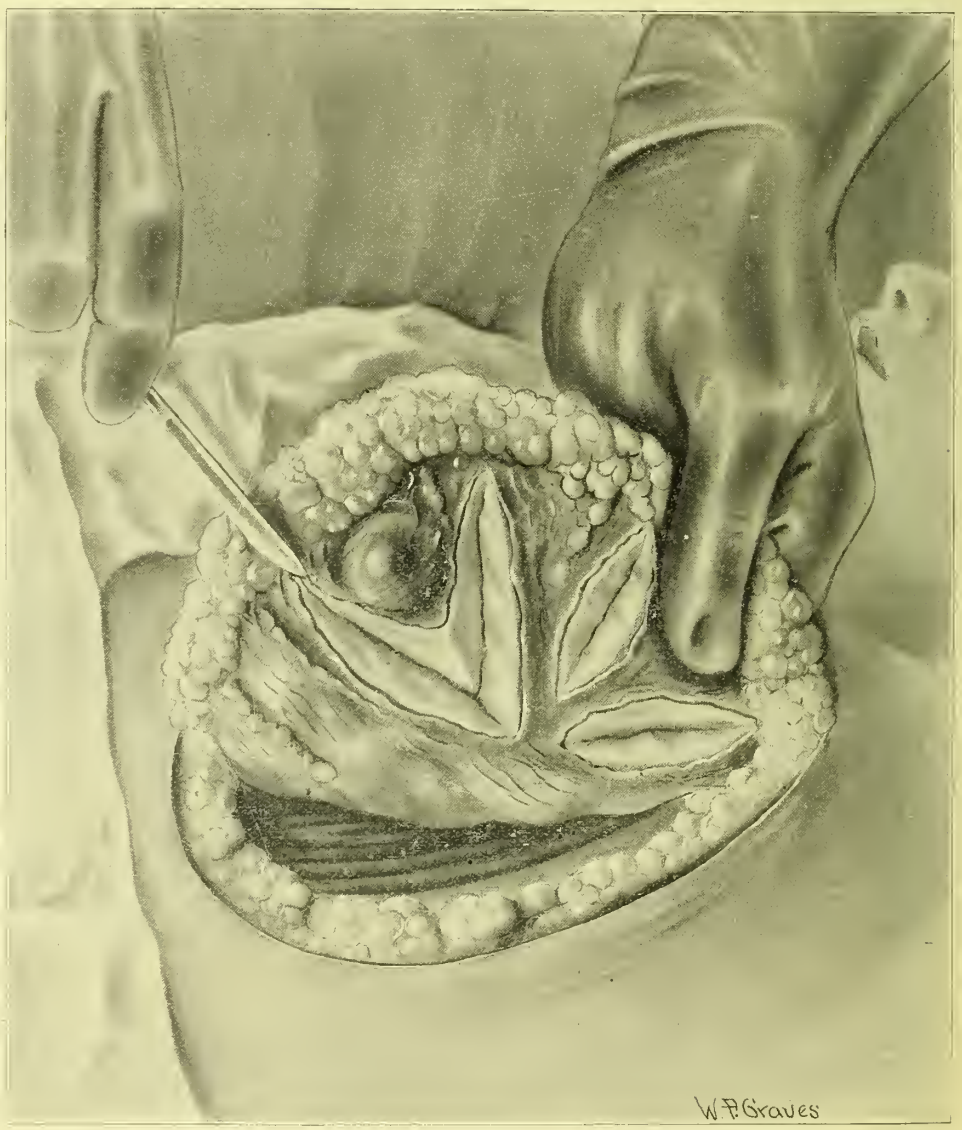

Fig. 13.—Plastic resection. Removal of wedge-shaped piece containing cysts. Radiating incisions in other lobules.

Periductal sarcoma is thus seen to be merely an exaggeration of the periductal fibroma and myxoma, occurring somewhat later in life and presenting a tumor of greater size. Tumors of this nature, although generally described as sarcoma, have long been recognized to be of a very slight degree of malignancy. Schimmelbusch[7,8] has perhaps taken the most advanced position in this regard. The encapsulation and the absence of axillary or pulmonary metastasis would appear to support this contention, and it must be admitted that fibroma, myxoma and sarcoma are all tumors which are very closely related. It is unusual, in fact, to find a specimen of periductal sarcoma which does not show in some portions the characteristic picture of myxoma and of fibroma. The tendency to malignancy of the tumors of this group is only slight, and they cause disturbance principally of a local character. The danger of carcinoma is very remote. They cannot, however, be regarded as innocuous because of the limited tendency which they present to excessive growth and ulceration. For these reasons, operative removal is indicated. This may best be done in the small fibromata by the operation later to be described, under the term of "plastic resection of the mammary gland." The larger sarcomata and myxomata, however, require amputation. Although the determination of the end results of periductal sarcoma has not been worked out, a point not coming within the scope of this paper, my own experience has led me to estimate the tendency to recurrence after operation at a far lower figure than the 50 per cent. of Gross[9].

9. Gross, S. W.: American Jour. Med. Sci., July, 1887.

FIBRO-EPITHELIAL GROUP—EPITHELIAL TYPE—CYST-ADENOMA.

A certain number of tumors of the fibro-epithelial group present such marked epithelial changes as to merit description under another heading separate from the tumors of the periductal fibrous type. Tumors of this nature occur in two main classes; both of which, however, are much rarer than the tumors of the fibrous type. For these two classes I have adopted the names (1) *fibro-cyst adenoma,* and (2) *papillary cyst-adenoma.* The tendency to the formation of cysts in all inflammatory or neoplastic conditions of the mammary gland has been the cause of great confusion in nomenclature. A sharp line of differentiation, however, should be possible between a tumor of local unicentric growth and a diffuse process involving multiple areas in the gland or even the breast of the other side. For this reason I have seen fit to reject the term of "cyst-adenoma," for all but local new growths of a cystic character, the majority of which are tumors which come under the clinical classification the papillary type. Multiple diffuse cyst formation in the breast I prefer to class as abnormal involution, and under that heading I will go more at length into the nomenclature of other writers. The occurrence of cystic tumors among the periductal fibromata has already been remarked, and allusion was there made to their purely secondary character.

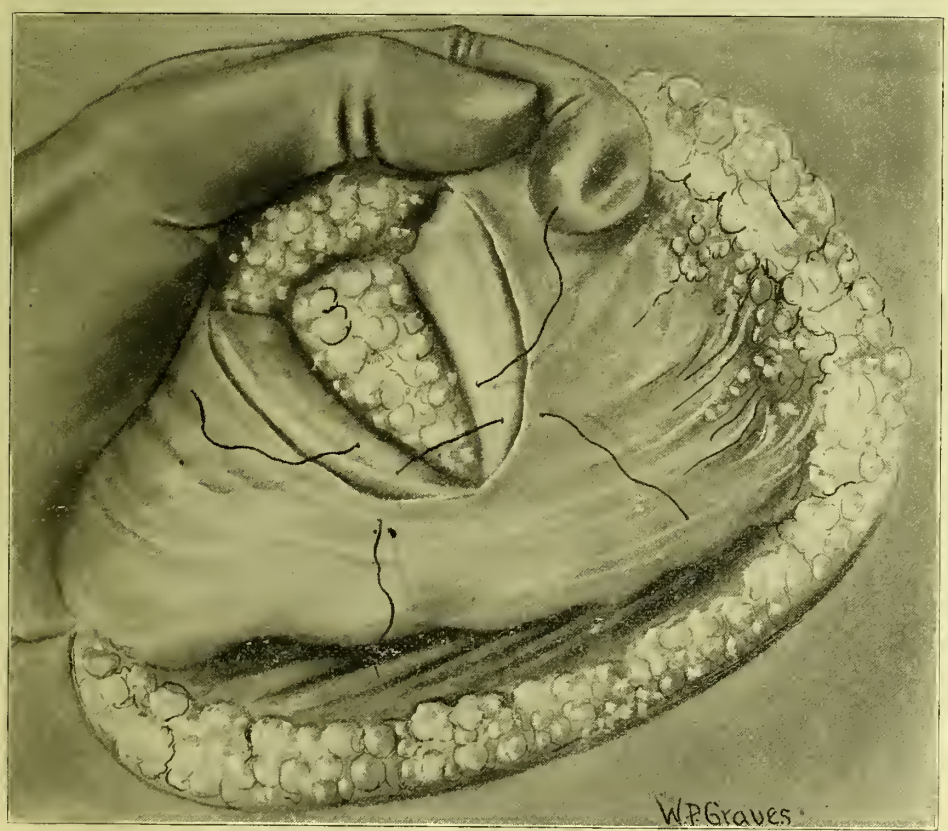

Fig. 14.—Plastic resection. Reconstruction of breast with buried sutures.

FIBRO-CYST-ADENOMA.

In four cases in this entire series secondary epithelial new growth occurred in a periductal fibrous tumor, producing a combination of lobular and cystic epithelial growth in a stroma of periductal tissue. To these tumors I have applied the name of "fibro-cyst-adenoma." They may be regarded as an epithelial exaggeration of the periductal fibroma and their anatomical structure differs from the fibroma only in the secondary proliferation of their epithelium. Tumors of this character have been described by other writers chiefly as adenomata, papillary cyst-adenomata, cysto-adenoma-proliferum, poly-cystoma, cystic fibroma, tubular-adenoma, etc. The characteristics of the fibro-cyst-adenomata were as follows. The size of the tumors varied from the size of a walnut to that of a fist. They were lobular and of hard consistency, and movable under the skin. They had in general the appearance of a periductal fibroma in which the epithelial lined slits greatly preponderate. The axillary glands were not enlarged and the nipples were not affected. On section these tumors presented a definite capsule and a lobular structure containing cysts of varying sizes. The cysts presented papillary outgrowths of connective tissue with a covering of epithelium. Microscopic examination showed marked proliferation in the epithelial cells lining the cyst cavity and covering the papillary outgrowths. The ducts appeared to be more involved in these tumors than the acini of the gland. All occurred in young single women, the average age being 32. They were tumors of slow growth and of long duration. Pain and discharge from the nipple were not recorded. All of these tumors were removed by excision without amputation of the breast.

The prognosis of tumors of the fibro-cyst-adenoma type must be regarded as entirely favorable, and removal of the tumor without amputation of the breast gives freedom from recurrence. It must be said, however, that the indication for operation in these tumors is even greater than in the fibromata, because of the epithelial proliferation which they present and the possibilities of its later development into carcinoma.

PAPILLARY CYST-ADENOMA.

The last group of tumors of the fibro-epithelial type comes under the heading of "papillary cyst-adenoma." These tumors are perhaps the most distinctive in clinical characteristics of any of the benign neoplasms of the breast. Nine cases occurred in the hospital series and three in private practice. They thus form the majority of the tumors which go to make up the epithelial division of the fibro-epithelial group. Tumors of this nature have been described by different writers under many headings. Gross,[10] in his classification in 1880, attempted to restrict to them the term "adenoma" or "true adenoma," with the intention of indicating

10. Gross, S. W.: Tumors of the Mammary Gland, New York, 1880.

the growth of glandular epithelium in the form of tubes and ducts which they present. The English writers[11, 12, 13] describe these tumors under the terms villous papilloma, duct papilloma, or by what, in the light of modern investigation, we must consider the misnomer "duct cancer." By German writers[14, 4, 15, 7, 16] they are commonly known as cyst-adenoma-papillare, poly-cystoma proliferum, intracanalicular cyst-adenoma, proliferating cyst-adenoma, or papillary cystoma.

To my mind the term papillary cyst-adenoma is the most satisfactory name for tumors of this variety. The histologic picture of a papillary or warty outgrowth is that of a connective tissue pedicle surmounted by an epithelial covering. Papillary structures of this character are the distinguishing feature of the tumors of this group and serve to differentiate them absolutely from other benign tumors of the breast. Tumors of this character rarely attain great size. Their consistency is hard, although fluctuation may occasionally be detected. Adherence to the skin and enlargement of the axillary glands are not to be expected. The situation of the tumor in the breast is generally beneath or in close relation to the nipple. On gross examination these tumors present the picture of a cyst cavity containing papillary or villous outgrowths from its wall. The fluid contents of the cyst is generally hemorrhagic. Microscopic section shows the characteristic papillary outgrowths of connective tissue surmounted by a luxuriant growth of epithelium. The epithelium in these cases presents the characteristics of ductal rather than acinal epithelial cells. The average age of the cases of tumors of this type was 52 years; and married women, especially those who have borne children and reared large families, appear to be especially predisposed. As a rule the tumors are of slow growth and of long duration. The most characteristic symptom, however, is the discharge of bloody fluid from the nipple, which occurs in the majority of cases.

Amputation was done in three cases of papillary cyst-adenoma and resection and excision in six. The absence of recurrence after operation is strong evidence in favor of the right of the tumor to a place in the category of benign neoplasms.

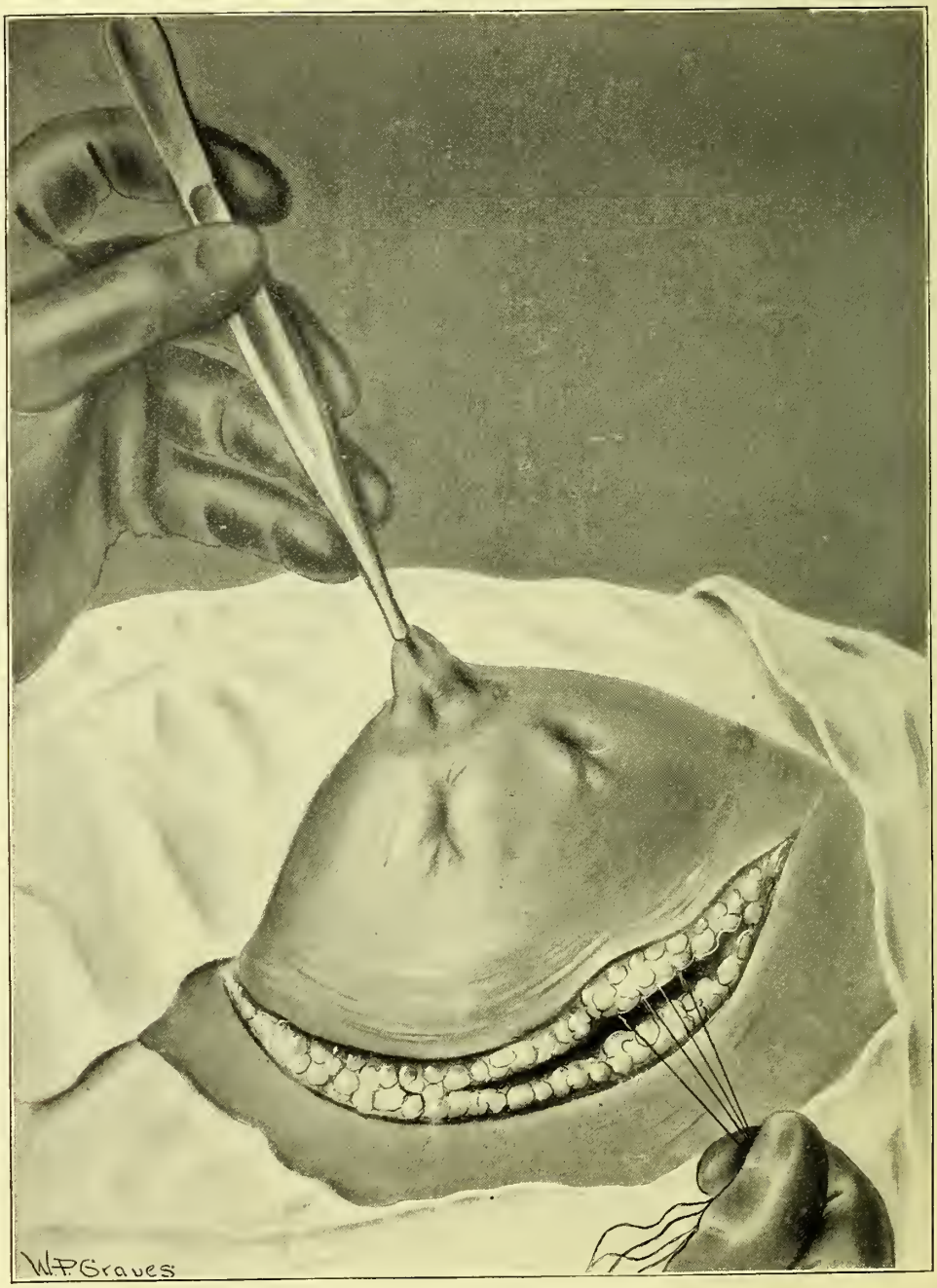

Fig. 15.—Plastic resection. Reconstruction of breast with buried suture. Eversion of nipple.

Papillary cyst-adenoma is thus seen to be a tumor occurring late in the life history of the breast, and one to which the functional activity of the gland in a certain measure predisposes. They are comparatively rare, but their significance must not be overlooked on that account, and it should be noted that although only nine cases occurred during this decade in the hospital

11. Bryant: "Diseases of the Breast." Cassel & Co., London, 1887.
12. Sheild. "Diseases of the Breast," London. McMillan & Co., 1898.
13. Williams: "Diseases of the Breast," London, 1894. John Bale & Sons.
14. v. Angerer: von Bergmann's, Bruns' and Mikulicz' Handbuch der Prakt. Chirurgie, vol. ii, p. 569.
15. Sasse: Archiv. für klin. Chirurgie, 1897, vol. liv, p. 1.

series, during that time two cases of cancer were found in which this disease was also present. In fact papillary cyst-adenoma has been thought to predispose to a special form of cancer, "adeno-carcinoma-destruens" (Tietze[16]), and this condition was present in both of the cases to which I have referred. The prognosis then of these tumors with early and complete removal is good. If not removed by operation, however, the danger of malignant sequelæ is very great.

HYPERPLASIA.

The term "hyperplasia" I have reserved in this classification for those processes in the breast which are of a diffuse character and for this reason to be sharply differentiated from the local unicentric process of actual tumor formation.

By hyperplasia is meant an increase in the fibrous and epithelial elements of the breast, affecting one or more lobules of the gland, and presenting the microscopic picture of an increase in the number of cell elements of both of the significant tissues, the fibrous stroma and the epithelium. Under this category two main divisions can be made: (1) "diffuse hypertrophy" of the breast, and (2) abnormal involution.

DIFFUSE HYPERTROPHY.

The so-called "diffuse hypertrophy" of the breast is a rare disease, but one which has received attention from many writers.[17] Two instances of this disease are included in the hospital series of cases, and fortunately the two cases serve to illustrate well the two main subvarieties of this condition.

One form of diffuse hypertrophy and perhaps the most common variety, is that which occurs in connection with pregnancy.

Of this form we have an example in the case of a woman of 43, who had undergone two miscarriages and who presented the abnormalities and diseases of the pelvic organs which have so frequently been noted in connection with this disease. Both breasts were affected and were uniformly enlarged. The consistency of the breasts was soft, but hard, stringy nodules could be detected on palpation. Microscopic examination showed the presence of fat, loose fibrous tissue and atrophied gland structures. There were no cysts nor discrete fibromata. The breasts gave trouble only from their size, and the pain was of an insignificant character; a double amputation was performed.

The other case serves to illustrate the condition as it appears in younger women. This occurred in an unmarried girl of 17, and involved the left breast only, which was enlarged to two or three times the size of the breast on the other side. The consistency of the breast was nodular and corded, and tenderness or "mastodynia" in this case was a marked feature. Irregularity of catamenia was noted, but no other abnormality of the pelvic organs could be determined. In this case no operation was done and a year and a half later, under palliative treatment by supporting bandages, the enlargement of the breast had partially subsided, and tenderness and mastodynia had diminished to a moderate extent.

ABNORMAL INVOLUTION.

The hyperplastic changes in the tissue of the mammary gland which accompany the process of involution have long been the subject of contention and controversy among pathologists and clinicians. The chief source of difficulty in the classification of the involution changes of the breast is undoubtedly to be attributed to the tendency which the gland exhibits to the formation of multiple cyst cavities. In all probability a moderate degree of dilatation of the ducts may be considered the normal condition of the breast at a certain stage of its decline, and only when these cysts and their surrounding stroma become so extensive as to attract attention by the induration which they produce, does the process attain a degree of abnormality sufficient to classify it as pathologic. Multiple cystic disease of the breast has long been recognized, and has been many times described under a multitude of different terms. Abernethy and Bell considered this a form of hydatid disease as did also Sir Astley Cooper. Brodie took the view that the cysts were caused by dilatation of the pre-existing ducts, and the French surgeons of that time agreed in this interpretation. Paget believed that cysts were formed in the breast both by obstruction and by active new growth, and the German school of pathologists of that time were inclined to attribute the multiple cysts of the declining breast to an active new growth of the acinal epithelium, although Virchow was a believer

Fig. 16.—Empire bandage.

in the obstructive origin of mammary cyst formation. A new impetus was given to the study of this disease by Réclus,[18] who in 1860 attempted to show that the cysts were produced by an active new growth of the epithelium of the gland closely allied to carcinoma, and gave to it the name of intra-acinous cystic epithelioma. Later publications in 1887 called attention more specifically to the epithelial origin of these growths, and the disease became known in France as the "maladie de Réclus."

From the time of Réclus' later publications, many different theories have been advanced to explain the occurrence of multiple cysts in the involuting breast. These theories may be grouped into three main classes which may be briefly described as follows:

1. *Inflammatory Theory.*—The prevailing theory

16. Tietze: Deutsche Zeitschrift für Chirurgie, 1900, vol. lvi, p. 512.

17. Kirschelm: Archiv. für klin Chirurgie, 1902, vol. lxvii, 2, p. 582.

18. Reclus: Gazette des Hopitaux, July 7, 1887, p. 673.

among French[19, 20, 21] and English surgeons, [22, 23, 12, 13] and the view which has been vigorously supported by Koenig[24] and other German surgeons,[25] attributes the cyst formation to inflammatory origin, "chronic cyst mastitis." Whether this inflammatory process arises from infection of the ducts, as believed by the French writers, or whether it is of a more remote character is not determined. The chief points on which the theory is based are the evidences of chronic inflammation in the round-cell infiltration and thickened stroma of the gland, and in the clinical course of the disease, which is thought to be subject to repeated exacerbations. Koenig lays great stress upon the increased swelling and sensitiveness at the time of the catamenia.

2. *New-Growth Theory.*—The second theory, advanced originally by Schimmelbusch,[7] and supported by Sasse,[15] Maly,[26] and to a certain extent by Tietze,[16] attributes the process to an actual new-growth. This theory is widely accepted in Germany, and has obtained some support in other countries. Because of the supposed relation to tumor formation, the names of cyst-adenoma (Schimmelbusch[7]) poly-cystoma (Sasse[15]), or cystoma (Tietze[16]) have been proposed. It should be stated that Sasse and others attempt to distinguish the lesser degrees of this disease, under the name of "involution cyst," from the more advanced process of "poly-cystoma." The line, however, between the two conditions appears to be determined with the greatest difficulty.

3. *Involution Theory.*—A later theory, and the one which has been supported by the investigations which have been carried on in this country, rejects both the inflammatory and the neoplastic origin, and refers the proliferation of the breast epithelium to the abnormal conditions produced by involution. This is, in a measure, a return to the views of Réclus, who recognized the significance of the epithelial proliferation, but erred, in considering this the origin of the process.

Tietze[16] agrees that the disease is chiefly epithelial in character, and of a more diffuse distribution than would warrant the title of a tumor. Bloodgood[27] has recognized this fact in the name which he suggests of "senile atypical parenchymatous hypertrophy." Greenough and Hartwell[28] made a study of thirty cases of this disease in 1902. By these writers the chronic appearances of the stroma of chronic cystic disease of the breast are considered to be of secondary importance, whereas the diffuse character of the epithelial proliferation is thought to be evidence sufficient to prevent the interpretation of the process as an actual new-growth. According to their views, the connective tissue increase is attributed to the normal process of involution and atrophy which the breast gland shares during its declining stage, with other organs of the genital apparatus. Cystic changes of the ducts and acini are produced by obstruction from this thickened fibrous tissue. Up to this point the process may be considered physiologic. It has long been understood, however, that the epithelium of the breast gland is of notoriously unstable equilibrium, and the abnormal condition of cyst formation provides a stimulus which in about half the cases of this disease, as nearly as can be estimated, leads to secondary proliferation of the epithelium. Were we able to state at what point this epithelial proliferation would cease, no danger from this disease need be apprehended, but it has been determined by a number of different observers that in the proportion of about one case in ten this epithelial proliferation oversteps the bounds of hyperplasia into the territory of malignant new-growth. It is probably to these proliferative cases of abnormal involution that Sasse and Schimmelbusch would restrict the term poly-cystoma or cyst-adenoma, and it must be confessed that a certain number of advanced cases of abnormal involution can be distinguished with great difficulty from actual new-growth. It has seemed to me, however, to be safer to restrict the term "cyst-adenoma" to tumors of local origin and well determined outline, and to apply the general term of hyperplasia or abnormal involution to all of those diffuse processes which by their microscopical appearances are still within the pale of benign diseases of the breast.

The chronic interstitial mastitis of the English writers,[22, 23, 11, 12] chronic cirrhosing mastitis (Billroth[6]), maladie cystique de la mammelle or intra-acinous cystic epithelioma (Réclus[18]) maladie de Réclus,[10] maladie noneuse de la mammelle (Phocas[21]) chronic cystic mastitis, (Koenig[24]), periductal mastitis (Delbet[20]), poly-cystoma epitheliale (Sasse[15]), cyst-adenoma (Schimmelbusch[7]), plexiform fibroma (French[19] writers) chronic mastitis or diffuse fibro-adenoma (Wood[29]), cystic disease of the breast (Bryant[11]), and fibrous and glandular hyperplasia with retention cysts,—are but a few of the designations which have been applied to this disease. The last term, which was evolved by Dr. W. F. Whitney pathologist to the Massachusetts General Hospital, is probably the most correct and satisfactory appellation for this condition which could be devised, but suffers in being too unwieldy for practical use. For this reason I prefer the name of "abnormal involution."

Eighty-seven cases of abnormal involution appear in the hospital series and 28 in the cases from private practice. Of this total number 59 show lesions which are classified as cystic only, the remaining 56 presenting evidence of epithelial proliferation. A certain amount of fibrous tissue increase with more or less round-cell infiltration is characteristic of involution of the breast under any circumstances.

The changes which have been classed as cystic are those presented by breasts in which this fibrous thickening has produced dilatation of the ducts alone without obvious changes in the character of the epithelium. The proliferative group are those which are characterized in addition by proliferative changes in the epithelium of the cysts or acini.

Of the proliferative group, three subdivisions have been distinguished according to the character or degree of the epithelial growth. (1) Proliferation of the acini, (2) papillary outgrowths of epithelium into cysts, and (3) adenomatous proliferation of epithelium. The significance of these three groups will appear in the discussion of their special characteristics. The gross appearances of cases of abnormal involution may be summarized as follows: A considerable proportion of

19. Binaud and Braquehaye: Deutu and Delbet's Traité de Chirurgie, Paris, 1899, vol. vii.
20. Delbet: Bull de Soc. d'Anat. de Paris, January, 1893, Paris.
21. Phocas: Report of Fourteenth French Congress of Surgeons, Paris, 1901, p. 470.
22. Banks: Lancet, 1900-01, p. 843, and 1902-01, p. 309.
23. Paul: Transact. London Pathological Soc., 1901, vol. lii, p. 30.
24. Koenig, F.: Lehrbuch der Speciellen Chirurgie. (Sixth edition.) Vol. ii, Hirschwald, 1893, Berlin; Centralblatt für Chirurgie, 1893, vol. xx, p. 49.
25. Roloff: Deutsche Zeitschrift für Chirurgie, 1899, vol. liv, p. 106.
26. Maly: Zeitschrift für Heilkunde, 1898, xix, p. 355.
27. Bloodgood: Jour. Amer. Med. Assoc., Aug. 6, 1904, p. 367.
28. Greenough & Hartwell: Journal Medical Research, 1903, vol. x, No. 4, p. 146.
29. Curtis & Wood: Medical News, New York, Aug. 13, 1904, p. 294.

the cases are diffuse in character, while others present local indurations of the breast tissue of varying size and situation. The consistency of this induration is hard or nodular; although softer and even fluctuating areas are occasionally noted. It would seem, however, that a cyst to be appreciated with certainty by its elastic feeling or fluctuation must attain considerable size. Pain and tenderness are present in about half of the cases, and although not diagnostic this symptom must be considered of significance in view of the generally painless character of carcinoma. Axillary glands are detected in only a small proportion of the cases. It has been my impression, based on clinical experience, that inversion of the nipple is a frequent accompaniment of abnormal involution, and it may certainly be stated that previous diseases or abnormalities of the breast, such lesions especially as interfere with the normal function of the gland, are predisposing factors in the origin of this disease.

On gross examination these specimens show fibrous induration of the breast gland with the presence of multiple cystic cavities containing fluid varying from a clear serum, through all the shades of brown and green and black. The process is diffuse in the vast majority of cases, although one lobule of the gland is often noted as the situation in which the disease is most advanced. Under microscopic examination fibrous hyperplasia and secondary involvement of the gland structures with cyst formation is observed.

The majority of cases occurred between 40 and 50 years of age. Married women were apparently the more susceptible to the disease. The duration was a matter of considerable variation, and the rate of growth was generally slow. Trauma was apparently of comparatively little etiologic importance. In this series of cases the relation between exacerbations of the disease and the catamenial period was conspicuous by its absence, only four cases having stated that the induration was influenced in its sensitiveness or in size by the monthly period. Discharge from the nipple was noted in fourteen cases, and was relatively more frequent among the proliferative than among the purely cystic types of involution. The character of the discharge varied from yellow serum and watery or milky fluids to brownish and bloody fluid and even pus. Of the fourteen cases, however, which showed a discharge from the nipple, seven presented tumors immediately beneath the nipple, and it is probable that discharge from the nipple will be found to depend more on the situation of the cyst than on the character of the epithelial changes within its wall. The right breast was involved in 27 cases, the left in 42, and both breasts in 17. The tendency to the involvement of both breasts in this disease is worthy of remark. So far as the situation of the induration in the breast tissue is concerned, the outer and upper hemispheres appear to be the seats of predilection; and the upper and outer quadrant, as in almost all diseases of the breast, is the region most commonly affected. Diffuse induration involving the whole breast occurred in 14 cases. Operation was performed in 86 of these 87 cases. In 41 the entire breast was amputated. In 45 an excision or resection of the breast was done after the method later to be detailed.

The subclassification of the cases of the proliferative type is of interest only from a histologic point of view, and can be determined only by microscopic examination.

The 36 hospital cases which presented proliferation were subdivided as follows: Ten showed an apparent increase in the number of the gland acini, when compared with normal breasts of the same age, and conditions of marriage, childbirth and lactation. This increase in the number of acini was accompanied in the majority of instances by a proliferation of the epithelium to such an extent that thickened or even solid columns of cells were produced, retaining, however, the characteristic formation of the gland ducts, and presenting no infiltration beyond the basement membrane. The significance of this form of proliferation could not be determined from the cases which were available for examination. But it is not improbable that it may ultimately lead to carcinoma. In support of this assertion one case of scirrhus cancer occurred in the hospital series and two in private practice, in which abnormal involution of the acinal type was also present. The clinical characteristics of cases of acinal proliferation were not to be distinguished from those of other types of abnormal involution.

Another class of epithelial proliferation in abnormal involution is to be described under the term of papillary proliferation. This group again is one of only histologic significance. By this term is meant a growth of epithelium in cyst cavities of such a nature that the epithelial cells are heaped up and project into the cavity, without a connective tissue pedicle or support. The microscopic picture of this papillary projection suggests strongly that more epithelium is produced in the lining of the cyst wall than can be accommodated on the basement membrane, with the result that certain portions are forced out toward the center of the cavity. There were 18 cases of abnormal involution which presented this form of proliferation. Of this class, again, the clinical characteristics are not to be distinguished from those of other forms of abnormal involution.

The third and last type of epithelial proliferation which is to be distinguished is that to which Tietze[16] and Greenough and Hartwell[28] have applied to the name of "adenomatous" proliferation. Adenomatous proliferation occurs only in cases in which papillary outgrowths are already present, and must be regarded as a somewhat more advanced type of epithelial growth. In these cases the papillary outgrowths from different portions of the cyst wall appear to meet and fuse together, and the resulting microscopic picture is that of a space filled with epithelial cells in which here and there an open gland lumen is observed. This form of proliferation occurred in eight of the hospital cases and in four of the cases from private practice.

Adenomatous proliferation derives its greatest interest, however, from the fact that it is chiefly in its presence that we find the combination of involution and carcinoma. During the ten years in which the 12 cases of adenomatous proliferation have been collected, 517 cases of cancer have come under observation. Of this number there were 15 which presented the lesions of abnormal involution and carcinoma. Three of these cases showed scirrhus carcinoma in connection with abnormal involution of the acinal type of proliferation. These have already been considered. Of the remaining 12 cases, 9 showed adenocarcinoma with involution changes of the papillary and adenomatous character. In the three other cases medullary carcinoma of a more advanced type was recorded in the pathologic report. Thus during the collection of 115 cases of abnormal involution 15 cases of this disease in combination with carcinoma were obtained, or 13 per cent. This figure is somewhat greater than the 10 per cent, which has been found by Tietze,[16] Greenough and Hartwell,[15] and others; but may be considered as very closely approximating the actual condition.

Attention must again be called to the fact that the clinical symptoms of these proliferative types of abnormal involution are to be distinguished in no way from those of simple abnormal involution, and by no sign on physical examination can the degree of epithelial growth be determined. Microscopic examination is therefore absolutely necessary for the correct classification of the individual case, and in fact the variation between the different portions of the same gland is so great that microscopic examination of all of the tissues is necessary to a correct diagnosis.[30] For these reasons and because of the

30. The prognosis of a given case of abnormal involution untreated is a matter of some uncertainty. Spontaneous rupture or discharge of the cyst through the nipple may rarely occur, and the entire process subside for a time, or indeed, forever. Suppuration of the cyst is occasionally observed. More often the disease becomes stationary at a certain stage of its development or advances slowly involving more and more of the gland and the breast of the opposite side. Carcinoma develops in something more than 10 per cent of all cases.

liability to carcinoma which these cases present, I have no hesitation in recommending operative treatment for abnormal involution in every case. An induration in the breast gland at or about the time of the menopause which is palpable with the flat of the hand against the chest wall I consider sufficient indication for operation.

For cases of this character I perform "plastic resection of the mammary gland," by means of which a thorough exploration of the gland may be obtained and portions of a suspicious nature may be removed for microscopic investigation without the mutilation of an amputation. This operation I would recommend for every case of abnormal involution in which the diagnosis can be established.

CHRONIC INFLAMMATORY DISEASES.

The chronic inflammatory diseases of the breast are divisible into two main classes, those occurring in connection with lactation, and those produced by specific inflammatory diseases such as tuberculosis. It is to these diseases of the breast that the much abused term "chronic mastitis" should really be applied, but this term has been so loosely employed that its use in any way is at present inadvisable. In addition to the two main classes detailed above, I have ventured to place in the category of chronic inflammation two cases of non-malignant eczema of the nipple, and five cases of single retention cyst of mechanic origin. It is to be regretted that no case of syphilis or actinomycosis entered the hospital during this decade, as it is under this heading that these diseases should be classified.

There were eight cases of chronic lactation mastitis and thirteen of tuberculosis in the hospital series. Chronic lactation mastitis has been again subdivided into five cases of chronic abscess and three of inflammation of the ducts (ductal mastitis). The cases of ductal mastitis show multiple small abscesses and necrotic foci distributed through the breast gland in close relation with the larger ducts. Clinically they present tender indurated masses in the breast. The mass may be adherent to the skin, and enlarged axillary glands may be present. Microscopically these breasts show an increased amount of fibrous tissue with small yellowish foci of necrosis and abscess cavities, while the tissue about the ducts is infiltrated with great numbers of small round cells and leucocytes. The disease especially affects young women, and may be attributed to infection of the ducts during the process of lactation. The chief clinical characteristics are diffuse induration of the breast occurring shortly after lactation, with a tendency to involvement of the skin and more pain and tenderness than would be expected with a tumor. In two of our cases the breast was amputated, and in one the affected lobule was excised.

CHRONIC ABSCESS.

Five cases of chronic or subacute abscess of the breast occurred during the decade. All presented a tumor or nodular induration of the breast of varying size, and in only one case was fluctuation to be detected. Tenderness, adherence to the skin and enlargement of the axillary glands were occasionally noted. The pathologic examination showed one or more abscess cavities of varying size, and microscopic examination showed excessive infiltration of the gland tissue with leucocytes and round cells. The patients were all young adults. All were married, and four had had children, but one had never been able to nurse her child. Two gave a history of previous acute breast abscess. The abscesses were, as a rule, of slow development, and pain was not a pronounced symptom. In two cases old discharging sinuses from previous acute abscesses were still present. In three cases incisions with drainage were made; in one case the breast was amputated, and in one the affected lobule was excised.

GALACTOCELE.

One of the cases of chronic abscess presented, in addition to the abscess, the picture of a retention cyst in a breast which was in active lactation. This condition has been repeatedly described under the name of galactocele, but its occurrence is comparatively infrequent, as may be seen from the fact that but one instance occurred in our total of 758 cases. The symptoms of galatocele do not differ appreciably from those of single retention cysts, except that the condition occurs in a breast which is yet, or has been recently, in active lactation. Under these circumstances the contents of the cyst is of a milky rather than of a serous character, because of the milk-secreting function of the cells which line the cyst at this period of the breast's development.

TUBERCULOSIS.

In this division are included the thirteen cases of chronic disease of the breast produced by the tubercle bacilli. Indurated masses of varying size were produced in the breast, of irregular outline and varying consistency. Tenderness and fluctuation were present in most of the cases. The tendency to involvement of the skin was marked, and in seven cases there were discharging sinuses present at the time of operation. Enlargement of the axillary glands was generally noted. Tuberculosis of other organs was present in only three cases. Microscopic examination of the specimens showed the characteristic tubercular tissue with cheesy foci of necrosis and the typical histologic peculiarities of tuberculosis.

The average age was 30 years, and in three cases the patients were under 20 years of age, although the disease was well distributed through the decades of adult life. Married women who had borne children appeared to be the most susceptible, and in two cases acute abscess had occurred during a previous lactation. The average duration was nine months and the development of the disease was of a chronic character. Pain was absent in about half the cases. Both breasts were involved in only one case; and the upper and outer quadrant was again the seat of predilection. In seven cases the breast was amputated, in four a portion was excised, and in two the abscess was simply opened and drained. The immediate result in all of these cases was satisfactory.

SINGLE RETENTION CYST.

Five cases occurred in the hospital series which presented the characteristics of a single cyst, of varying size, with no abnormality of the surrounding tissues. These cases have been separated from those of abnormal involution because of their purely local character and the absence of pathologic changes in the breast tissue in their immediate vicinity. It is not to be denied that a certain number may belong properly among those of abnormal involution, and that a more extensive examination might have given data which would justify their inclusion among the latter class. In the absence of these data, however it has seemed wiser to place the single retention cysts in a separate class. Cysts of this character have been described under the name of "evolution" cysts by Gross.[10] They differ in

no way from the simple cysts produced in other glandular structures by accidental occlusion of a duct. We are especially familiar with cysts of this type in the epididymis and the salivary glands. Occlusion of a duct may be due to any one of a number of different causes; congenital defects, trauma, and the scars of transient inflammatory processes of the nipple or in the substance of the gland, being perhaps most frequently observed. Operations on the breast for small fibromata are not infrequently followed by cicatricial obstruction of the ducts.

The five cases here presented varied from 21 to 49 years of age—three were single and two married women. The duration was comparatively short (an average of about two months) and development was rapid: there was no pain or tenderness as a rule, and the clinical appearances were those of a single, painless, elastic, fluctuating tumor, varying in size from a walnut to a hen's egg, and of uniform and rapid growth. The axillary glands were not enlarged. Excision was done in every case, and a single thin-walled cyst removed without other abnormality of the gland. The fluid contained in these cysts varied from clear serum to a fluid of yellowish brown color—with more or less turbidity. The significance of a single retention cyst in the breast must be considered very slight, and their chief interest and importance lies in the difficulty in distinguishing them from the multiple cysts of abnormal involution. Because of this difficulty, exploration and excision are to be advised.

NON-INDIGENOUS TUMORS OF THE BREAST.

A certain number of tumors of the breast occur which are situated in that organ only accidentally, as it were, and have no special relation to the mammary gland as regards their origin. Among these tumors I have classed the sarcomata which were derived, not from the periductal tissue, but from other sources, and which presented no evidence of inclusion of the glandular elements of the breast. Two of these tumors were classified as fibro-sarcoma, one was of mixed cells and one of spindle cells. All were much smaller in size than the periductal sarcomata, and all appeared to involve the breast gland before removal. The tendency to the involvement of the skin in these tumors was marked, two being actually ulcerated and one other showing marked adherence and brownish discoloration. The ages varied widely, from 33 to 70 years. All were in married women. The duration varied from 6 months to 10 years. Two were of slow growth and two more rapid within the last few months. Discharge from the nipple was not noted and the axillary glands were found enlarged in only one case. Pain was generally present. Amputation was done in three cases and extensive excision in the fourth. The origin of these tumors appeared to be from the connective tissues forming the stroma of the mammary gland. The essential anatomic elements of the mammary gland were merely displaced by their growth, and they differ in no respect from sarcoma of a similar character arising in other organs. Their size was smaller than the periductal sarcoma, but with this exception the two forms were with difficulty to be distinguished.

The other non-indigenous tumors of the breast were lipoma and lymphangioma. Three cases of lipoma occurred in the hospital series and one in private practice. They were freely movable and not tender. No enlargement of the glands or abnormality of the nipple could be detected. They were multiple in one case. The ages of the patients varied from 20 to 66 years. the duration of the tumors from three to 20 years. They were of slow growth and occasioned no objective symptoms. All of the cases were operated on, excision being done in two and amputation in a third.

A single case of lymphangioma occurred during this decade. This was a cavernous lymphangioma in a girl of 16, which started in the axilla and involved the breast only by secondary extension. It was of six years' duration. Examination showed a dense fluctuating tumor the size of a man's head occupying the position of the breast, but being situated behind the gland and extending from there to the axilla and into the neck. The whole mass was removed without amputation of the breast and the patient made a good recovery.

SUPERNUMERARY BREAST.

One instance of this condition is included in the series of cases from private practice, and another was accidentally discovered in one of the hospital cases of periductal fibroma. Both occupied a situation at the anterior margin of the axilla; and this appears to be the most common site, although supernumerary breasts in other situations along the so-called "milk-line" from the axilla to the groin, are occasionally reported (Young[31]).

Both cases presented a small collection of glandular tissue without a nipple. No symptoms were produced in either case, and in one the tumor was discovered only in routine physical examination. In the other anxiety was aroused by the presence of the axillary tumor, but was promptly relieved when the correct diagnosis was ascertained.

In neither of these cases was there any evidence in support of the theory that supernumerary breasts are more prone to tumor formation than breasts in a normal condition; and indeed this theory is probably one of those which have been handed down from writer to writer without satisfactory evidence for its support (Martin[32]). The rarity of cases of supernumerary breast (only two occurring in 758 cases) is the probable explanation of this uncertainty in the matter of prognosis.

PLASTIC RESECTION OF THE MAMMARY GLAND.

As Stewart[33] justly says, there is a lamentable and unnecessary difference of opinion as to the treatment of doubtful tumors of the breast.

Many of the tumors are situated in such portion of the gland as to involve disfiguring scars in a conspicuous locality if an incision is made directly over the tumor. Many operations designed for benign tumors involve an amputation of the breast. This unfortunate organ has suffered countless mutilations in times past in conformity with prevailing customs. Thomas[34] first sought to overcome this difficulty by proposing an incision along the lower and outer border of the breast, but details as to his technic are wanting in the original article, and the method does not seem to have been generally adopted.

In the treatment of cysts Abbé[35] has advocated an exploratory puncture, and gives a large number of permanent cures effected by simply evacuating the cyst. McGraw[36] has also written upon the treatment of cysts by aspiration, and in the main agrees with Abbé, although he notes two cases in which he observed the

31. Young, E. B.: Boston Medical and Surgical Journal, vol. cl, p. 319, 1904.
32. Martin, E.: Archiv. für klin, Chirurgie, 1893, vol. xlv, p. 880.
33. Stewart, J. Clark: The Journal A. M. A., Aug. 6, 1904, p. 365.
34. Thomas: New York Medical Journal, 1882.
35. Abbé: Medical Record, New York, Aug. 15, 1903.
36. McGraw: American Medicine, July 25, 1903, p. 142.

development of cancer after this procedure. Bull[37] also has long been an advocate of aspiration of cysts, and had no cases of cancer following aspiration in his own experience. McGraw's two cases, however, are excellent concrete examples of the theoretical dangers of aspiration.

At one time I was in the habit of using exploratory puncture to determine the nature of a doubtful growth, and for this purpose used a Mixter punch (a long steel cylinder of small caliber with a handle at one end and sharp edges at the other). Richardson, however, later reported cases in which an extension of the cancerous process was observed along the line of puncture; and although I have succeeded in curing many a cyst by puncture, I have abandoned it as routine practice. In doubtful cases it may cause serious displacement of cancer cells; in cases of cystic disease it disposes only of the larger cysts. I should still use the method, however, in exceptional cases, such as in the presence of a large cyst near the nipple in a small breast which could be easily palpated.

Herbert Snow[38] has recently recommended removal of cystic tumors of the breast by forcible massage. Cysts can undoubtedly be ruptured in this way and permanently cured, but it is not a method of precision, and would be most dangerous advice for general adoption.

Stewart[33] advises an exploratory procedure so planned as to avoid contact of cut lymphatics with any tissues left behind, and any chance of dissemination of cancer cells by pressure before the removal of the breast.

Bloodgood[27] agrees in advising exploratory incision, and states that this operation is the routine treatment of doubtful tumors at the Johns Hopkins Hospital. Curtis[29] and Morris[39] support this recommendation and Morris calls attention to the ease with which consent may be obtained for an exploratory operation early in the course of the disease, when the possibility of avoidance of a total amputation can be urged.[40]

The operation which I have gradually elaborated, starting with the so-called Thomas incision, consists in the removal of a V-shaped portion of the gland containing the cyst or tumor, and exploratory radiating incisions in the remainder of the gland. In the early operations I undertook to remove all sections of the gland involved in cystic changes, and in several cases this resulted in removal either of the entire gland or of all but fragments here and there of the cortical portion. These fragments were brought together with catgut sutures placed at certain points, or by a single purse-string suture, so that in the breasts of women possessed of a fair amount of adipose tissue the organ could be reconstructed and the nipple (which previously perhaps had been inverted) could be restored to its normal shape. In this way the outward shape and appearance of the breast could be maintained while the entire mammary gland had been removed. Further experience, however, showed me that this radical measure was in the great majority of cases unnecessary. The details of the operation as I now perform it are as follows:

The preliminary incision is longer than that contemplated by Thomas, and, starting at the lower border of the breast, opposite the middle of the outer arc of the lower inner quadrant, it runs along the lower fold and outer margin to the inner border of the axilla, thus severing the lymphatic connections of the breast with the axillary plexus of lymph glands. The incision should be carried down to the lower border of the pectoralis major muscle, which should be freely exposed. The dissection is then carried along through the loose connective tissue which lies between the pectoral fascia and the posterior layer of the fascia in which the mammary gland lies. With the left hand the operator reflects the breast upward and inward so that the posterior surface of the gland becomes exposed in its entire length. The gland tissue can now be seen through the transparent fascia and easily inspected. If cysts are present they are readily observed, as the majority of them lie in the posterior portions of the gland. Usually there are one or two large cysts lying in the same quadrant. This portion can be removed by a V-shaped incision without opening the cysts. The apex of the V lies directly under the nipple in the central portion of the gland. Radiating from this point incisions can be carried into the gland tissue in all directions, exposing and bisecting all small cysts so that no cyst, however small, remains that has not been laid open by the knife. A second V incision may occasionally be necessary, but this is rarely the case. The next step of the operation, after arresting hemorrhage from the larger vessels, is to close the V-shaped opening with two rows of catgut sutures, one along its anterior borders, and one bringing its posterior edges into contact. The gland is now released from the hand of the operator and dropped back on to the pectoral muscle, and it will be found that the various incised portions of the gland resume their natural positions and fit accurately together. A few sutures may be needed to arrest hemorrhage from small arteries in the gland substance, but this is not usually necessary. The gland should next be anchored to the subjacent pectoral muscle at its outer edge, and still another row of sutures is advisable to hold together the deep layers of the superficial fascia before closing the outer edges of the wound with silkworm gut. The buried sutures are useful in removing strain from the surface suture.

The dressing should be applied so as to produce lateral compression of the two hemispheres, as the ordinary swathe tends to tear the buried gland sutures apart. I have devised for this purpose a bandage which crosses in front and is pinned like a diaper; the ends of each half are then caught into two loops which are attached to suspenders crossing over the shoulders (empire bandage). This bandage can be elaborated into a breast supporter, which is made for me by Messrs. Leach & Greene of Boston. If the breast operated on contains a benign tumor, the tumor can be removed by the V-shaped incision, the double suturing of the gland incision being carried out as before. I have found it better to make a clean V cut even in the cases of the periductal fibromata, as I have always found the capsule of these tumors more closely adherent to the gland tissue than is usually represented to be the case.

In case of exploratory operations for cancer the incision can be carried a little farther from the gland border if necessary and sufficiently deep to sever all lymphatic connections with the axillary lymphatics or those which run through the pectoral muscle. The incision into the posterior surface of the gland, if cancer

37. Bull: Medical Record, New York, 1899, No. 16, p. 557.
38. Snow: British Medical Journal, Oct. 17, 1903.
39. Morris: The Journal A. M. A., Aug. 6, 1904, p. 368.
40. Other references which may be consulted on the general subject are as follows: Clopton: Inter-State Medical Journal, June, 1904. Dreyfus: Virchow's Archiv, vol. cxiii, p. 535. Ellis: Annals of Surgery, September, 1903. Renton: British Medical Journal, April, 1903. Warren: Annals of Surgery, December, 1904.

be found, should be closed by a single suture before proceeding with the major operation.

I have called this operation plastic resection of the mammary gland, as the incision and subsequent sutures are devised with special reference to restoring the gland as nearly as possible to its normal shape and to improve often the outward appearance of the nipple. In case of inversion of the nipple as is often seen in abnormal involution, the gland tissue should be so laid open from behind that a subcutaneous purse-string suture can be placed around the base of the nipple and force it outward.

I have performed plastic resection of the gland in 66 cases, in 8 of which both breasts were operated on, so that I have performed the operation in all 74 times. The great majority of these operations were for abnormal involution, but in no case have I had any recurrence of cyst formation. It is remarkable how completely all trace of the incisions into the gland tissue disappears. It is usually difficult to tell from the feel, only a few months after the operation, what portion of the gland has been resected. As the outward cicatrix is practically invisible to the patient, the result from a cosmetic point of view is also most satisfactory. In three cases only have I found suppuration of the gland to take place, and this was attributed to infection from the cavity of the cyst. One was a case of large multiple cysts; another was a large cyst near the nipple; and the third was a case of papillary cystadenoma near the nipple in an old woman. I have tested many exposed cysts for bacteria, but have invariably obtained negative results. I should, however, advise the operator to avoid opening the larger cysts if possible, and to use catgut for deep ligatures and sutures, as they are quickly absorbed and leave no trace of their presence in the sensitive structure of the gland. I have had stitch abscess in the skin sutures in two cases only, neither of which was in private practice.

As will be seen from my experience in 74 cases, the operation is attended with little risk or discomfort to the patient, who may be assured that it can be performed without a prolonged convalescence and without disfigurement of any kind. I venture, therefore, to offer it to the profession as a satisfactory substitute for the disfiguring exploratory incision on the anterior surface of the breast, for the uncertainties of puncture, and for the mutilation caused by amputation.